

NON-PUBLIC?: N
ACCESSION #: 8808020246
LICENSEE EVENT REPORT (LER)

FACILITY NAME: McGuire Nuclear Station, Unit 1 PAGE: 1 of 8

DOCKET NUMBER: 05000369

TITLE: Unit 1 ESF Actuation And Unit 2 Blackout Occurred As A Result Of
Personnel Taking Wrong Action, Coincident With Valid Failure Of
Diesel Generator 2A

EVENT DATE: 06/24/88 LER #: 88-014-00 REPORT DATE: 07/25/88

OTHER FACILITIES INVOLVED:

FACILITY NAME: Unit 2 DOCKET #: 05000370

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR
SECTION
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:

NAME: Steven E. LeRoy, Licensing TELEPHONE #: 704-373-6233

COMPONENT FAILURE DESCRIPTION:

CAUSE: X SYSTEM: EI COMPONENT: PS MANUFACTURER: C600
REPORTABLE TO NPRDS: Y

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT: On 06/24/88 at 1029 when Transmission personnel opened Power Circuit Breaker (PCB) 62 to prepare for a Nuclear Station Modification (NSM) on 2B Busline, normal offsite power was lost to the 2ETA and 2ETB Buses, resulting in a loss of essential power (Blackout) to Unit 2. Diesel Generators (D/G) 2A and 2B started and loaded as designed; however, D/G 2A tripped after less than thirty seconds. Unit 1 Nuclear Service Water (RN) valves 1RN-41B and 1RN-43A, Nonessential Header Supply 1B Isolation Valves, closed on the Unit 2 Blackout signal as designed, constituting an ESF actuation. The Blackout occurred because all four 6900 Volt (V) switchgear assemblies were mistakenly aligned to be powered from 2ATB Main Auxiliary Transformer (2B Busline) while OPS was preparing for NSM work on 2B Busline. OPS restored normal power to Bus 2ETA by 1037 and started RN Pump 1A to supply the Unit 1 RN system Nonessential Header until valves 1RN-41B and 1RN-43A were reopened at 1125. The probable cause of the D/G trip was a slow response of D/G 2A lube oil pressure switches

that caused a false low lube oil pressure signal to be generated. The switches were recalibrated. The procedure for Custom Component pressure switches will be revised, and this event will be reviewed by a representative from each OPS shift. The Unit 2 Blackout is assigned a cause of Personnel Error. The Unit 1 ESF actuation occurred as a direct result of the Blackout. The Valid Failure of D/G 2A is assigned a cause of Other.

(End of Abstract)

TEXT: PAGE: 2 of 8

INTRODUCTION:

On June 24, 1988 at 1029, when Transmission personnel opened Power Circuit Breaker (EIS:MJB) (PCB) 62 to prepare for a Nuclear Station Modification (NSM) on 2B Busline, normal offsite power was lost to the 2ETA and 2ETB Buses, resulting in a loss of essential power (Blackout) to Unit 2. Diesel Generators (D/G) (EIS:DG) 2A and 2B started and loaded as designed; however, D/G 2A tripped after less than thirty seconds (Valid Failure). Unit 1 Nuclear Service Water (RN) system (EIS:BI) valves 1RN-41B and 1RN-43A, Nonessential Header Supply 1B Isolation Valves (EIS:ISV), closed on the Unit 2 Blackout signal as designed, constituting an Engineered Safety Features (ESF) system (EIS:JE) actuation.

Operations (OPS) discovered that the Blackout occurred because all four 6900 Volt (V) switchgear (EIS:SWGR) assemblies were mistakenly aligned to be powered from 2ATB Main Auxiliary Transformer (EIS:XFMR) (2B Busline) while OPS personnel were preparing for safety tagging for scheduled NSM work on 2B Busline. The intent had been to align all four 6900 V switchgear assemblies to be powered from the 2ATA Main Auxiliary Transformer (2A Busline) while the 2B Busline work was performed.

OPS restored normal power to Bus (EIS:BU) 2ETA by 1037. OPS also started RN Pump 1A to supply the Unit 1 RN system Nonessential Header until valves 1RN-41B and 1RN-43A were reopened at 1125. Instrumentation and Electrical personnel investigated the D/G 2A trip and determined the probable cause to be slowly responding D/G 2A lube oil pressure switches (EIS:PS) that caused a false low lube oil pressure signal to be generated. The switches were recalibrated by July 6, 1988, and the instrument lines were cleaned.

OPS notified the NRC of the Unit 1 ESF actuation at 1140 and of the Unit 2 Blackout at 1403 on June 24, 1988.

Unit 1 was in Mode 1, Power Operation, at 100% power, and Unit 2 was in No

Mode (no fuel in the Reactor vessel) at the time of this event.

The Unit 2 Blackout event is assigned a cause of Personnel Error because OPS personnel mistakenly powered all four 6900 V switchgear assemblies from 2B Busline prior to deenergizing 2B Busline for work. The Unit 1 ESF actuation occurred as a direct result of the Blackout.

The Valid Failure of D/G 2A is assigned a cause of Other because a possible equipment malfunction of two lube oil pressure switches as a result of air or sediment in the instrument lines may have caused the D/G 2A trip.

EVALUATION:

Background

The Unit 2 6900 V Auxiliary Power system (EIIS:EA) distributes power to the Unit 2 Normal Auxiliary Power system and serves as the preferred power supply to the Unit 2 Essential Auxiliary Power system. The Unit 2 6900 V Auxiliary Power

TEXT: PAGE: 3 of 8

system consists of four independent switchgear assemblies designated as 2TA, 2TB, 2TC and 2TD. The normal power supply to switchgear 2TA and switchgear 2TC is the Unit 2 Main Auxiliary Transformer 2ATA (2A Busline), with the alternate supply being Unit 2 Main Auxiliary Transformer 2ATB (2B Busline). The normal power supply to switchgear 2TB and switchgear 2TD is 2B Busline, with the alternate supply being 2A Busline. The 2A and 2B Buslines are each sized to carry the loads of all four switchgear assemblies at the same time when either the 2A or 2B Busline is out of service.

For Train B, PCBs 61 and 62 provide power from the transmission system red and yellow buses to the Main Transformers and from the Main Transformers to the Main Auxiliary Transformers. PCB 61 and 62 are designed so that they may be opened from the Control Room or the switchyard; however, because of problems with the supervisory system, normally the PCBs have to be operated from the switchyard. The NSM work in progress during this event should restore the ability to open PCB 61 and 62 and the Train 2A PCBs from the Control Room.

The RN system provides assured makeup to the Auxiliary Feedwater (EIIS:BA), Component Cooling (EIIS:CC), Spent Fuel Pool Cooling (EIIS:DA), and D/G Cooling systems (EIIS:LB). Each of two 100% capacity RN pumps (EIIS:P) supply water to a 100% capacity train of essential equipment. A nonessential train of equipment is supplied from a normally open crossover connecting the two Essential Headers. During normal operation, the RN pumps

take suction from the Condenser Circulating Water (RC) system (EHS:SQ) supply crossover or from the Low Level Intake. However, in the event that a Blackout or Safety Injection signal is generated, RN Pump A suction is aligned to the Low Level Intake and RN Pump B suction is aligned to the Standby Nuclear Service Water Pond (SNSWP). The alignment to the SNSWP is the only alignment of the three available which has been analyzed to withstand all design basis events.

Valves 1RN-41B and 1RN-43A are designed to automatically isolate the RN Train 1B Essential Header from the Unit 1 Nonessential Header to ensure train separation and that no damage occurs to RN Pump 1B from excessive flow demand while the SNSWP is aligned as the suction source. RN Pump 1A discharge does not isolate from the Unit 1 Nonessential Header on a Blackout signal, and RN Pump 1A is normally manually started if not already running to supply the Unit 1 Nonessential Header and the Train 1A Essential Header if less than a total station Blackout occurs.

Description of Event

On June 24, 1988 at approximately 0830, OPS Engineer A discussed with the OPS Senior Reactor Operator and OPS Nuclear Control Operator (NCO) A that an NSM was to be performed on Unit 2 on the 2B Busline starting that morning. OPS Engineer A and NCO A agreed to align all four 6900 V switchgear assemblies to be powered from 2A Busline to prepare for the work. At approximately 0930, NCO A made a Hot Bus Transfer of two of the four switchgear assemblies to their alternate power sources. NCO A intended to switch 2TB and 2TD to their alternate power source (2A Busline) and leave 2TA and 2TC on their normal power source (2A Busline); however, according to a Unit 2 Reactor Operator's Logbook entry made by an NCO at

TEXT: PAGE: 4 of 8

0953, NCO A actually switched 2TA and 2TC to their alternate power source (2B Busline). NCO A also apparently left 2TB and 2TD on their normal power source (2B Busline).

At 1028:57, Transmission personnel opened PCB 61 locally in the switchyard after OPS Control Room personnel could not open the breaker from the Control Room. Transmission personnel then opened PCB 62 locally at 1029:05. Immediately, a Unit 2 Blackout occurred. D/Gs 2A and 2B started and loaded as designed. The D/G Load Sequencers completed sequencing at 1029:33, and D/G 2A tripped at approximately the same time.

At approximately 1029, OPS Control Room personnel noted that valves 1RN-41B and 1RN-43A had closed as designed when the Unit 2 Blackout signal was received. They attempted to reopen the valves, but the valves would not stay

open until OPS personnel were able to reset the sequencers on Unit 2. OPS Control Room personnel started RN Pump 1A to supply the Unit 1 Nonessential Header until valves 1RN-41B and 1RN-43A could be reopened.

At 1037, OPS restored normal power after aligning 2TA, 2TB, 2TC, and 2TD to be powered from the 2A Busline and closing in the 2ETA Feeder Breaker. Valves 1RN-41B and 1RN-43A were reopened, and RN Pump 1A was secured at 1125 after the Unit 2 sequencers had been reset.

The start and subsequent trip of D/G 2A was classified as a Valid Failure (Start No. 654). Although the only computer alarm indication on the Alarm Typer (EHS:XR) was that a D/G 2A engine overspeed had occurred, the trip was later concluded by Instrumentation and Electrical (IAE) personnel to have actually been caused by a probable false low lube oil pressure signal. (Low lube oil pressure yields an engine overspeed computer alarm.) Subsequent testing identified a slow response in the lube oil pressure switches, which was attributed to air or sediment in the instrument lines. Apparently the D/G tripped as soon as Alarm Restraint Relay ARR/FL (EHS:RLY) timed out, which was approximately eighteen seconds after D/G 2A achieved 95% speed. A subsequent start of D/G 2A on June 24, 1988 was classified as a Valid Success. A single low lube oil pressure alarm was received during this start, but apparently the trip setpoint was not reached.

OPS implemented the NRC Immediate Notification Requirement procedure to notify the NRC of the Unit 1 ESF actuation at 1140 and of the Unit 2 Blackout at 1403.

Conclusion

The Unit 2 Blackout event and resulting Unit 1 ESF actuation have been assigned a cause of Personnel Error. OPS NCO A understood the assignment to align the four 6900 V switchgear assemblies to be powered from 2A Busline to facilitate work on 2B Busline; however, when he actually attempted to make the alignment, he apparently aligned all four 6900 V switchgear assemblies to be powered from the 2B Busline which was later deenergized by Transmission personnel at the direction of OPS Engineer A for the NSM tagout and subsequent work. Therefore, the action taken by NCO A was inadvertently directed toward the wrong goal because he performed the opposite action than he had intended to perform.

TEXT: PAGE: 5 of 8

NCO A is an experienced operator who was fully qualified to perform this task. He did not purposefully switch 2TA and 2TC switchgear assemblies to their alternate power source on 2B Busline because he clearly understood the intention to remove all switchgear assemblies from the 2B Busline power

source. The four switches for the 2TA, 2TB, 2TC, and 2TD switchgear assembly power supplies are located in a vertical row on the Unit 2 Control Board and are clearly marked. The appropriate procedure was used to perform the Hot Bus Transfer; procedure OP/2/A/6350/05, AC Electrical Operation Other Than Normal Lineup, provides generic instructions for switching any of the four switchgear assemblies to alternate power supplies. All involved OPS Control Room personnel who were interviewed during this investigation stated that OPS Control Room personnel were unusually busy on the morning of June 24, 1988, primarily due to Unit 2 outage items such as Motor Operated Valve Acceptance Test support. Also, the second NCO who was assisting NCO A on Unit 2 on June 24 had only been licensed and working in the Control Room for approximately two months, which added to the responsibilities of NCO A. The second NCO made a contributing personnel error when he did not recognize a discrepancy in logic when he logged "2TA and 2TC placed on its alternate power source in preparation for taking down 2B Busline" in the Unit 2 Reactor Operator's Logbook at 0953. NCO A asked the second NCO to record this item in the logbook, but does not remember specifying that 2TA and 2TC were the switchgear assemblies placed on alternate power supplies.

The D/G 2A Valid Failure on June 24, 1988 at approximately 1029 was the sixth Valid Failure in the last 100 valid starts and second in the last 20 valid starts of D/G 2A, and the eighth in the last 100 valid starts of the Unit 2 D/Gs. The trip of D/G 2A is assigned a cause of Other because it was caused by a possible equipment malfunction. According to the investigation conducted by IAE after the D/G 2A trip, the most likely cause of the trip was air or sediment in the instrument lines for the Lube Oil to Engine DG A Pressure Switches, 2LDPS5123 or 2LDPS5120. IAE placed test gauges on the lines feeding these instruments and found the pressure buildup and decrease to be very slow. Actual lube oil pressure was verified to be satisfactory. For example, when actual lube oil pressure was 33 psig, pressure at the instruments was measured at approximately 20 psig. (The trip setpoint is 28.3 psi, decreasing.) IAE performed an initial bleeding of the instrument lines and some improvement in the pressure response time was noted.

IAE also identified a slight discrepancy (in the last calibrations of these two pressure switches, which were conducted in April 1988. The trip setpoints would have been reached slightly before the design value because existing reference legs were not compensated for during these calibrations. However, this error contributed very little to the trip setpoint being reached compared to the slow response of the pressure switches caused by air or sediment in the lines. Although the procedure used for calibration, Calibration Procedure For Custom Components Factory Set Pressure Switch, did not have a requirement stated to incorporate reference leg data where appropriate, an IAE person who calibrated pressure switches 2LDPS5120 and 2LDPS5123 in April 1988 is aware of this requirement. He does not recall a reason why a reference leg value would not

have been calculated and incorporated. All IAE personnel were trained on a lesson "Recognizing and Compensating for Water Legs" in 1987.

TEXT: PAGE: 6 of 8

IAE recalibrated the two pressure switches, which are Custom Component Company, model number 642Gem2, on July 6, 1988 and included the appropriate reference leg values. Pressure Switch 2LDPS5123 could only be adjusted to within +0.02 psi (or 1.7%) of the required range. This was accepted by IAE staff personnel because the low lube oil trip setpoint would be reached very slightly prior to the design value should low lube oil pressure become a problem, and a Custom Component representative stated that this difference is insignificant to the pressure switch operation. Both pressure switches 2LDPS5120 and 2LDPS5123 have been calibrated according to a yearly Preventative Maintenance schedule since 1983, and all calibrations have been documented as meeting the required tolerance. In addition to recalibrating the pressure switches, IAE flushed out the lube oil instrument lines and examined the oil for residue; no sediment was visible. Lube oil pressure switch instrument lines are drained during the yearly calibration and during the extensive preventative maintenance performed each refueling outage by Mechanical Maintenance. Mechanical Maintenance cleaned and/or replaced lube oil filters and strainers for D/G 2A on July 6, 1988.

A comprehensive design study and upgrade of the McGuire Instrumentation and Controls program is in progress at this time, which will eventually incorporate recently documented reference leg information into appropriate calibration documentation at McGuire. Currently IAE personnel are gathering reference leg data for the study so that the McGuire Instrumentation and Controls List may be accurately updated by Design Engineering personnel. IAE personnel have been instructed since the time of the April 1988 calibration of these pressure switches to consult an "information only" Water Leg Data Sheet Book to verify or incorporate new water leg values until the Instrumentation and Controls List is updated.

The D/G 2A governor valve actuator was replaced on June 1, 1988 after problems with frequency oscillation were encountered during a D/G 2A start for ESF testing. When consulted on previous D/G failures, a Woodward Governor Company representative has stated that intermittent problems may be experienced during D/G starts attempted shortly after governor valve replacement. However, D/G 2A has been started successfully seven times between the governor replacement and this failure, and normally, the problem experienced after governor replacement is slow start times.

A review of McGuire Licensee Event Reports (LER) revealed one other Blackout event, LER 369/85-33, which was attributed to personnel error in which the

action taken was inadvertently directed toward the wrong goal. Therefore, this part of the event is considered to be recurring. The corrective action for this LER was to cover the event with all OPS shift personnel. The review also revealed one ESF actuation, documented in LER 369/85-37, which occurred as a result of this type of personnel error. Therefore, this part of the event is considered to be recurring. Corrective actions for this event included training for Performance technicians and an evaluation of improving labeling in the Safeguards Test Cabinet.

No D/G Valid Failures were documented which were attributed to a similar instrument malfunction; therefore, this portion of the event is not considered to be recurring.

TEXT: PAGE: 7 of 8

The failure of the D/G 2A pressure switch is reportable to the Nuclear Plant Reliability Data System (NPRDS).

NOTE: The Unit 2 Events Recorder (EIIS:XR) was unavailable during this event because it did not have a backup power supply when normal power was lost. An NSM was completed since this event occurred which provides reliable backup power for the Events Recorder. A similar NSM has been completed for Unit 1.

CORRECTIVE ACTIONS:

Immediate: 1) Normal offsite power was restored to Unit 2 by 1037 on June 24, 1988.

2) RN Pump 1A was started to supply the Unit 1 Nonessential Header until valves 1RN-41B and 1RN-43A could be reopened.

3) Valves 1RN-41B and 1RN-43A were reopened, and RN Pump 1A was secured by 1125 on June 24, 1988.

Subsequent: 1) IAE recalibrated pressure switches 2LDPS5120 and 2LDPS5123 and flushed out the associated instrument lines on July 6, 1988.

2) Mechanical Maintenance cleaned and/or changed D/G lube oil filters and strainers as appropriate on July 6, 1988.

Planned: 1) IAE will revise the Calibration Procedure For Custom Components Factory Set Pressure Switch to add a prerequisite for IAE technicians to verify applicability of reference legs prior to calibration.

2) OPS Management will review this event with a representative from each shift.

SAFETY ANALYSIS:

Unit 2 was in No Mode when the Blackout occurred. No fuel was in the Reactor vessel; therefore, no Residual Heat Removal system (EH:BP) pump was running. Also, D/G 2B started and loaded as designed on the Blackout signal. Therefore, no safety problems occurred as a result of this event. Normal power was restored within eight minutes of the loss of power. The Valid Failure of D/G 2A in conjunction with the loss of offsite power to Unit 2 is more conservative than the initial conditions for accident analysis of a "Loss of Non-emergency Power to the Station Auxiliaries" in the McGuire Final Safety Analysis Report, Section 15.2.6, since there was no fuel in the Reactor vessel at the time of the incident, and D/G 2B started and loaded as designed to carry all essential loads. If D/G 2B had not started and loaded properly, OPS personnel would have referred to procedures AP/2/A/5500/07, Loss of Electrical Power, and EP/2/A/5000/09, Loss of All AC Power. These procedures provide instruction to energize the 4160 V buses from Unit 1 if necessary.

TEXT: PAGE: 8 of 8

When the Blackout alignment for RN Pump 1B to take suction from the SNSWP was initiated, valves 1RN-41B and 1RN-43A closed as designed on the Unit 2 Blackout signal to protect RN Pump 1B from damage and to assure supply to the Train 1B Essential Header. OPS promptly started RN Pump 1A to augment RN flow and provide flow to the Train 1A Essential Header and the Unit 1 Nonessential Header until the two isolation valves could be reopened for RN Pump 1B to supply the Unit 1 Nonessential Header.

No personnel injuries, radiation overexposures, or releases of radioactive material occurred as a result of this event.

This event is considered to be of no significance with respect to the health and safety of the public.

ATTACHMENT # 1 TO ANO # 8808020246 PAGE: 1 of 1

DUKE POWER COMPANY
P.O. BOX 33189
CHARLOTTE, N.C. 28242
HAL B. TUCKER TELEPHONE
VICE PRESIDENT (704) 373-4531
NUCLEAR PRODUCTION

July 25, 1988

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

Subject: McGuire Nuclear Station, Units 1 and 2
Docket Nos. 50-369 and 50-370
Licensee Event Report 369/88-14

Gentlemen:

Pursuant to 10CFR 50.73 Sections (a)(1) and (d), attached is Licensee Event Report 369/88-14 concerning a Unit 1 ESF actuation and a Unit 2 blackout that occurred on June 24, 1988. This report is being submitted in accordance with 10CFR 50.73(a)(2)(iv). This event is considered to be of no significance with respect to the health and safety of the public.

Very truly yours,
/s/ Hal B. Tucker
Hal B. Tucker

SEL/105/sbn

Attachment

xc: Dr. J. Nelson Grace American Nuclear Insurers
Regional Administrator, Region II c/o Dottie Sherman, ANI Library
U.S. Nuclear Regulatory Commission The Exchange, Suite 245
101 Marietta St., NW, Suite 2900 270 Farmington Avenue
Atlanta, GA 30323 Farmington, CT 06032

INPO Records Center Mr. Darl Hood
Suite 1500 U.S. Nuclear Regulatory Commission
1100 Circle 75 Parkway Office of Nuclear Reactor Regulation
Atlanta, GA 30339 Washington, D.C. 20555

M&M Nuclear Consultants Mr. W.T. Orders
1221 Avenue of the Americas NRC Resident Inspector
New York, NY 10020 McGuire Nuclear Station

*** END OF DOCUMENT ***
